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JUN 16 2004

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Mail Stop OP1-17
Washington, DC 20555-0001

SUSQUEHANNA STEAM ELECTRIC STATION
LICENSEE EVENT REPORT 50-387/2004-003-00
PLA-5770

Docket 50-387

Attached is Licensee Event Report 50-387/2004-003-00. This event was determined reportable per 10 CFR 50.73(a)(2)(iv)(A) in that the Unit 1 reactor was manually scrammed in response to main turbine bearing high vibration. The turbine had recently been replaced and was undergoing start-up testing as Unit 1 was returning to service following a planned refueling outage. The initiation of the manual scram and the subsequent injection of the RCIC cooling system are considered unplanned actuations of systems that mitigate the consequences of significant events. There were no actual consequences to the health and safety of the public as a result of this event.

No new regulatory commitments have been created through issuance of this report.

A handwritten signature in black ink, appearing to read "Richard L. Anderson".

Richard L. Anderson
Vice President - Nuclear Operations

Attachment

IE22

cc: Mr. H. J. Miller
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U.S. Nuclear Regulatory Commission
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LICENSEE EVENT REPORT (LER)

(See reverse for required number of
digits/characters for each block)

Estimated burden per response to comply with this mandatory information collection request: 50 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Records Management Branch (T-6 E6), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by Internet e-mail to bjs1@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202 (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

1. FACILITY NAME Susquehanna Steam Electric Station - Unit 1					2. DOCKET NUMBER 05000387					3. PAGE 1 OF 4				
4. TITLE Manual Scram Following Main Turbine High Vibration														
5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED					
MO	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO	MO	DAY	YEAR	FACILITY NAME			DOCKET NUMBER		
04	21	04	04	003	00	06	16	04	FACILITY NAME			DOCKET NUMBER		
9. OPERATING MODE 1			11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply)											
10. POWER LEVEL 17			20.2201(b)			20.2203(a)(3)(ii)			50.73(a)(2)(ii)(B)			50.73(a)(2)(ix)(A)		
			20.2201(d)			20.2203(a)(4)			50.73(a)(2)(iii)			50.73(a)(2)(x)		
			20.2203(a)(1)			50.36(c)(1)(i)(A)			X 50.73(a)(2)(iv)(A)			73.71(a)(4)		
			20.2203(a)(2)(i)			50.36(c)(1)(ii)(A)			50.73(a)(2)(v)(A)			73.71(a)(5)		
			20.2203(a)(2)(ii)			50.36(c)(2)			50.73(a)(2)(v)(B)			OTHER		
			20.2203(a)(2)(iii)			50.46(a)(3)(ii)			50.73(a)(2)(v)(C)			Specify in Abstract below or in NRC Form 366A		
			20.2203(a)(2)(iv)			50.73(a)(2)(i)(A)			50.73(a)(2)(v)(D)					
			20.2203(a)(2)(v)			50.73(a)(2)(i)(B)			50.73(a)(2)(vii)					
			20.2203(a)(2)(vi)			50.73(a)(2)(i)(C)			50.73(a)(2)(viii)(A)					
			20.2203(a)(3)(i)			50.73(a)(2)(ii)(A)			50.73(a)(2)(vii)(B)					
12. LICENSEE CONTACT FOR THIS LER														
NAME Eric J. Miller - Nuclear Regulatory Affairs										TELEPHONE NUMBER (Include Area Code) 570 / 542-3321				
13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT														
CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX					
14. SUPPLEMENTAL REPORT EXPECTED										15. EXPECTED SUBMISSION DATE		MONTH	DAY	YEAR
YES (If yes, complete EXPECTED SUBMISSION DATE).										X	NO			
16. ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)														
<p>At 16:35 on April 21, 2004 with Unit 1 in Mode 1 at 17% power, Susquehanna Unit 1 was manually scrammed in response to main turbine bearing high vibrations experienced during startup turbine testing. The turbine had been replaced during the recently completed Unit 1 refueling outage. After approximately 35 minutes of turbine operation at 1800 rpm and no load, a rub developed in the vicinity of bearing #2. Vibration increased to levels warranting turbine trip as directed by operating procedure. Despite the turbine trip, the rub continued to cause localized heating thus creating a rotor bow condition and a steady vibration increase. The Reactor Protection System was manually initiated and condenser vacuum was broken to allow for a more rapid decrease in turbine speed and, subsequently, vibration levels. Plant response to the manual reactor scram was in accordance with design. Causes cited for this event include: (1) Turbine startup vibration trip limits were not set sufficiently low to preclude rub induced high vibration (2) Vibration change rates were not monitored and used as a response input to high vibration conditions and (3) Project management did not establish contingency plans in sufficient depth to handle all potential vibration issues. After implementing corrective actions to address these deficiencies and performing a thorough evaluation to ensure equipment had not been adversely impacted by the high vibration, the turbine was successfully started and loaded in accordance with the established startup procedure. The manual RPS actuation and the subsequent manual initiation of the Reactor Core Isolation Cooling system, to assist with reactor level control, are unplanned actuations of systems that mitigate the consequences of significant events and are, therefore, being reported per 10CRF50.73(a)(2)(iv)(A). There were no actual adverse consequences to the fuel, any plant equipment, or to the health and safety of the public as a result of this event.</p>														

LICENSEE EVENT REPORT (LER)

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		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
		03	- 006	- 00	
Susquehanna Steam Electric Station - Unit 1	05000387				2 OF 4

17. NARRATIVE (If more space is required, use additional copies of NRC Form 366A)

EVENT DESCRIPTION

At 16:35 on April 21, 2004 with Unit 1 in Mode 1 at 17% power, Susquehanna Unit 1 was manually scrammed in response to main turbine (EISS Code: TA) bearing high vibrations experienced during startup turbine testing. The turbine had been replaced during the recently completed Unit 1 refueling outage. The startup was being controlled via plant procedure and did include contingency plans to address expected "rub" induced vibration of the new turbine. Component rubs were anticipated because the improved efficiency of the new turbine is attributable, in part, to tighter clearances at the steam packing glands. The plans to address rubs included a reduction in turbine speed to 100 rpm if predetermined vibration levels were reached to allow the rub to work itself out (i.e. allow the components to wear themselves into an effective fit). The contingency plans also provided for controlled Unit shutdown and the addition of balance weights to the appropriate rotor if necessary. The turbine startup was uneventful through 1800 rpm. Generally, bearing vibration levels were between 2 and 3.5 mils although bearing #8 reached approximately 5 mils. After approximately 35 minutes of turbine operation at 1800 rpm and no load, a rub developed in the vicinity of bearing #2. Vibration levels increased from approximately 3 mils to 11.5 mils. At this point, control room operators (Licensed, utility) tripped the turbine as directed by operating procedure. The rub continued to cause localized heating thus resulting in a rotor bow condition and a steady vibration level increase despite the turbine trip. In order to reduce turbine speed and, subsequently, vibration levels more quickly, operating procedures direct the breaking of condenser vacuum (EISS Code: SH) when extreme vibration levels are experienced. The rotor bow near bearing #2 caused increased vibration levels at bearings #1 and #3. When bearing #1 vibration levels increased rapidly to 25 mils, the Reactor Protection System (RPS; EISS Code: JC) was manually initiated in preparation for breaking condenser vacuum. By 16:48 hours, Main Steam Line Isolation Valves (MSIV; EISS Code: SB) were manually closed and condenser vacuum had been broken thus permitting turbine speed to decrease to less than 3 rpm. The turbine was then placed on the turning gear. While multiple speed decreases were anticipated during the test to allow turbine components to "rub" and ultimately create their own adequate operating clearances, it was not expected that a manual scram would be necessary to allow for a more rapid turbine speed reduction. As such, the manual RPS actuation and the subsequent manual initiation of the Reactor Core Isolation Cooling system (RCIC; EISS Code: BN) for level control purposes are not considered part of a pre-planned sequence and are, therefore, being reported in accordance with 10CRF50.73(a)(2)(iv)(A).

All control rods fully inserted on the scram. A Level 3 containment isolation signal was received, as expected. The signal did not, however, affect primary containment isolation valves (EISS Code: JM) in any system as all potentially affected valves were already positioned to their safety state. RCIC was manually initiated to assist reactor water level control. The lowest reactor water level reached was approximately 3 inches. Post-scram conditions were maintained within procedural operating requirements. No radioactive releases resulted from this event.

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17. NARRATIVE (If more space is required, use additional copies of NRC Form 366A)

CAUSE OF EVENT

Three root causes have been identified for this event:

1. The turbine trip limits were not set sufficiently low on startup to prevent high vibrations initiated by a rub event.
2. Vibration rates of increase were not monitored on startup and used as an input to identify impending high vibration.
3. Turbine Retrofit Project management did not establish contingency plans in sufficient depth to handle equipment failure, multiple vibration issues, and short time frames for analysis and action.

REPORTABILITY/SAFETY CONSEQUENCES ANALYSIS

Actual: This event was determined to be reportable under 10 CFR 50.73(a)(2)(iv)(A) in that unplanned system actuations occurred in response to main turbine bearing high vibrations experienced during startup turbine testing. The turbine vibration condition resulted in the manual actuation of RPS and the manual initiation of the RCIC system. The RCIC system was conservatively initiated to assist with reactor level inventory control following the scram.

All safety systems functioned as designed. All control rods inserted and post scram reactor conditions were maintained within procedural requirements. There were no challenges to Primary or Secondary containment (EIS Code: NH) and integrity was maintained. Water level was readily restored to the nominal operating band. There were no in-plant or offsite radiological consequences that resulted from this event. There were no safety consequences or compromises to the health or safety of the public.

Potential: Manual reactor scrams can challenge the safety functions of plant structures, systems, and components (SSC). High turbine vibration levels can damage turbine components and auxiliary systems.

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17. NARRATIVE (If more space is required, use additional copies of NRC Form 366A)

CORRECTIVE ACTIONS

The following corrective actions have been completed:

- A thorough inspection of plant components and an assessment of plant data were conducted to determine the potential for damage during the high vibration event. Results of this review supported turbine startup.
- Vibration amplitude and rate of change limits were procedurally established for the pending turbine startup.
- Closer observation of vibration amplitude and phase angle data on polar vibration plots was established for the pending startup.
- The turbine was successfully started and loaded in accordance with the established startup procedure.

The following corrective actions are planned:

- Startup vibration amplitude and rate of change limits will be procedurally established for future startups. During startup, vibration levels reaching conservatively established limits would require a reduction in turbine speed to 100 rpm.
- Sufficient and dedicated manpower support, with clearly defined responsibilities, will be procedurally established to enhance performance monitoring and to address any necessary contingency actions during future startups.
- Analytical tools will be utilized to monitor vibration amplitude, rate of change, and phase angle during future startups.

ADDITIONAL INFORMATION

Past Similar Events:

Susquehanna Unit #2 underwent its turbine retrofit and startup without incident.